
System architecture

Hardware architecture

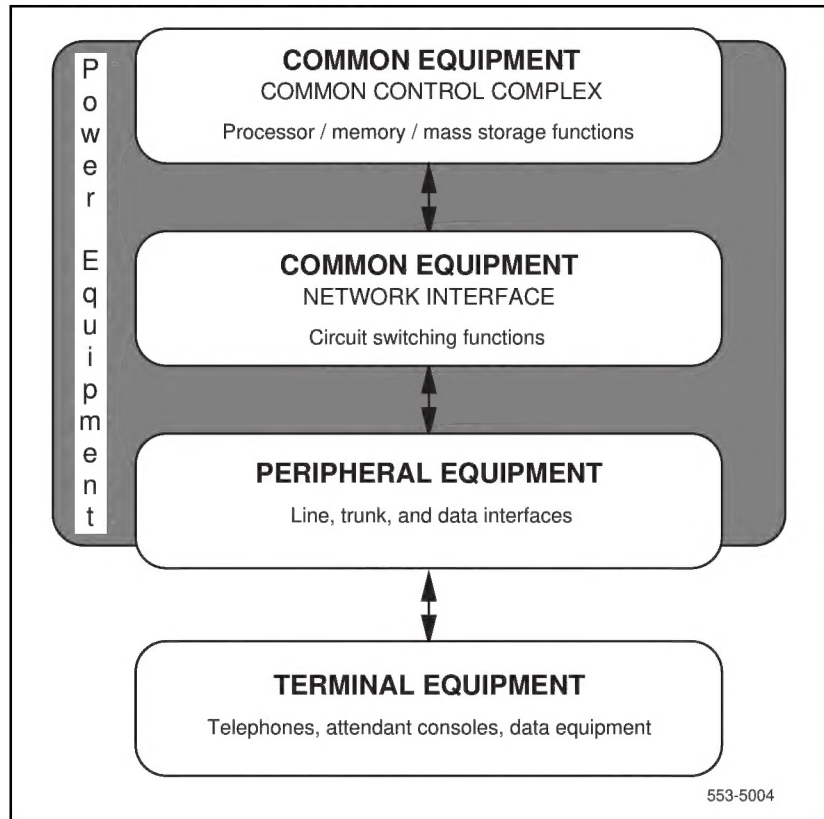
A Meridian 1 is a circuit-switched digital system that provides voice and data transmission. The internal hardware is divided into the following functional areas (see [Figure 19](#)):

- Common equipment circuit cards provide the processor control, software execution, and memory functions of the system.
- Network interface circuit cards perform switching functions between the processor and peripheral equipment cards.

Note: As shown in [Figure 19](#), the network interface function is generally considered a subset of the common equipment functions.

- Peripheral equipment circuit cards provide the interface between the network and connected devices, including terminal equipment and trunks.
- Terminal equipment includes telephones and attendant consoles (and may include equipment such as data terminals, printers, and modems).
- Power equipment provides the electrical voltages required for system operation, and cooling and sensor equipment for system protection.

Figure 19
Meridian 1 basic architecture



Common control

The processor is the common control complex of the system. It provides the sequences to process voice and data connections, monitor call activity, and perform system administration and maintenance.

The processor communicates with the network interface over a common control bus that carries the flow of information.

The common control complex consists of:

- the processor card or cards that provide the computing power for system operation
- system memory that stores all operating software programs and data unique to each system
- the disk drive unit that provides mass storage for operating programs and data
- I/O interfaces that provide an information exchange between the user and the system

Central processing unit

At system power-up, instructions stored in read-only memory (ROM) bring the system into a working state. The ROM then transfers data from the disk drive unit into the random-access memory (RAM) on cards that provide memory storage.

During system operation, the CPU cards access ROM and RAM data to perform control and switching sequences required by the system. The CPU also accesses and executes fault-clearing programs contained in ROM.

CPU design includes:

- 24-bit data words plus 1-bit parity
- 24-bit linear addressing that permits memory allocation to be assigned on a continuous basis
- asynchronous (handshake) bus operation
- 16 file registers, used to hold addresses and data for all operations
- a sense (interrupt) input line to indicate that a particular device requires action by the CPU
- a trap facility that, when activated by an external signal, causes the CPU to immediately execute instructions starting at a particular address

Dual-CPU systems, other than options 61C and 81C, provide changeover memory arbitration (CMA) through QPC581 or NTND10 CMA Cards (one per CPU). Using CMAs, each CPU is connected to both memory cards. The active CPU writes status changes to both memories and each CPU can read from either memory. If the active CPU fails, the backup CPU is activated. If the active memory fails, the same CPU continues to operate, but operates using the backup memory.

Note: The functionality described above does not apply to options 61C and 81C. See [“Advanced Meridian 1 system architecture” on page 71](#) for information specific to options 51C, 61C, 81, and 81C.

System memory

System memory stores all operating software programs and data unique to each system. Solid-state memory consists of both ROM and RAM.

ROM instructions are permanently programmed as firmware and housed on a CPU daughterboard. This memory stores basic operating programs, arithmetic functions, and the basic rules of operation necessary to initialize the system and bring it into a working state. ROM also stores the recovery, or trap, sequence that is automatically activated at power-up, system reload, or when certain faults are detected.

RAM is volatile memory stored on memory cards. There are three functional areas of RAM:

- The unprotected data store (UDATA) holds constantly changing, unprotected data (such as call registers, call connection, and traffic data) required during call processing.
- The protected data store (PDATA or office data) holds protected customer-specific information (such as trunk configuration and speed call data).
- The program store holds call processing programs, programs required for communication with ROM, programmed features and options (such as conference and call transfer), and diagnostic and maintenance programs.

Note: The functionality described above does not apply to options 51C, 61C, or 81C. See [“Advanced Meridian 1 system architecture” on page 71](#) for information specific to options 51C, 61C, 81, and 81C.

Disk drive unit

At system power-up or during a system reload, protected data store (office data) and program store information is automatically transferred from the disk drive (mass storage) unit to the system memory. During regular operation, the CPU accesses information from the memory.

Note: The functionality described above does not apply to options 51C, 61C, 81 or 81C. See [“Advanced Meridian 1 system architecture” on page 71](#) for information specific to options 51C, 61C, 81, and 81C.

If information in the protected data store is changed (such as a change in a telephone configuration), the information on the disk drive unit must be updated. Transferring data from the system memory to the disk drive unit is called a data dump. Data dumps can occur automatically or manually (through software program commands).

The following types of disk drive units are used in Meridian 1 systems:

- NTND15 FDU:
 - used in option 21E with X11 release 18 and later
 - two 3.5-inch floppy disk drives with a formatted capacity of 2.88 MB each; 5.76 MB total
- NTND16 Multi Disk Unit (MDU):
 - used in options 51, 61, and 71 with X11 release 18 and later
 - two 3.5-inch floppy disk drives with a formatted capacity 2.88 MB each; 5.76 MB total
 - one 3.5-inch hard disk with 120 MB formatted capacity
- NT8D69 Multi Disk Unit (MDU):
 - used in options 51, 61, and 71 with X11 release 15–17
 - two 3.5-inch floppy drives with a formatted capacity of 1.44 MB each; 2.88 MB total
 - one 3.5-inch hard disk with a minimum formatted capacity of 20 MB
- NT9D33 Small System Multi Disk Unit (SMDU):
 - used in option 21E and STE systems with X11 release 18 and later
 - two 3.5-inch floppy drives with a formatted capacity of 1.44 MB each; 2.88 MB total
 - one 3.5-inch hard disk with a minimum formatted capacity of 20 MB
- NT6D64 Core Multi Drive Unit (CMDU):
 - used in option 81 Core Module version with X11 release 18 and later
 - used in options 51C and 61C with X11 release 19 and later
 - one 3.5-inch floppy disk drive with a formatted capacity of 2.88 MB
 - one 3.5-inch hard disk with 120 MB formatted capacity

— NT5D61 Input/Output Disk Unit with CD-ROM (IODU/C):

- Two IODU/C hardware vintages are available in X11 release 23:

NT5D61AA includes the hard-drive, 2MB floppy drive, and
following: CD-ROM drive

NT5D61AB includes the hard-drive, and 2MB floppy drive
following:

- used in options 51C, 61C, 81, and 81C Core/Network Module with X11 release 23 and later
- one 3.5-inch floppy disk drive with an industry-standard formatted capacity of 1.44 MB
- one 3.5-inch hard disk with 120 MB formatted capacity

Also included on the NT5D61AA IODU/C: a CD-ROM drive to allow installation of system software from CD.

— NT5D20 IOP/CMDU:

- used in options 51C, 61C, 81 and 81C Core/Network Module with X11 release 21 and 22
- one Input/Output Processor (IOP)
- one 3.5-inch floppy disk drive with a formatted capacity of 2.88 MB
- one 3.5-inch hard disk with 120 MB formatted capacity

Input/output interfaces

Input/output (I/O) ports provide an interface between the system and external devices, such as terminals and teletypewriters, and application module link (AML) applications, including Meridian Mail and Meridian Link. The I/O devices can be located at local or remote sites.

Prior to X11 release 18, a total of 16 I/O ports could be configured per system. With Release 18 and NT6D80 Multi-purpose Serial Data Link (MSDL) Cards, a maximum of 64 I/O ports are supported (there are four ports per card, up to 16 cards can be configured). However, the maximum number of AML ports supported remains at 16.

Network switching

Network switching, based on digital multiplexed loops, interconnects peripheral ports. A loop transmits voice, data, and signaling information over a bidirectional path between the network and peripheral ports.

Network cards digitally transmit voice and data signals, using space switching and time division multiplexing technology. Network switching also requires service loops (such as conference and TDS loops), which provide call progress tones and outpulsing.

Two types of cards provide network switching control:

- the NT8D04 Superloop Network Card, which provides four loops grouped together in an entity called a superloop
- the QPC414 Network Card, which provides two loops

Network organization

On most Meridian 1 system options, network loops are organized into groups. A system is generally configured as one of the following:

- a half-group system that provides up to 16 loops
- a full-group system that provides up to 32 loops
- a multiple-group system that provides up to 160 loops

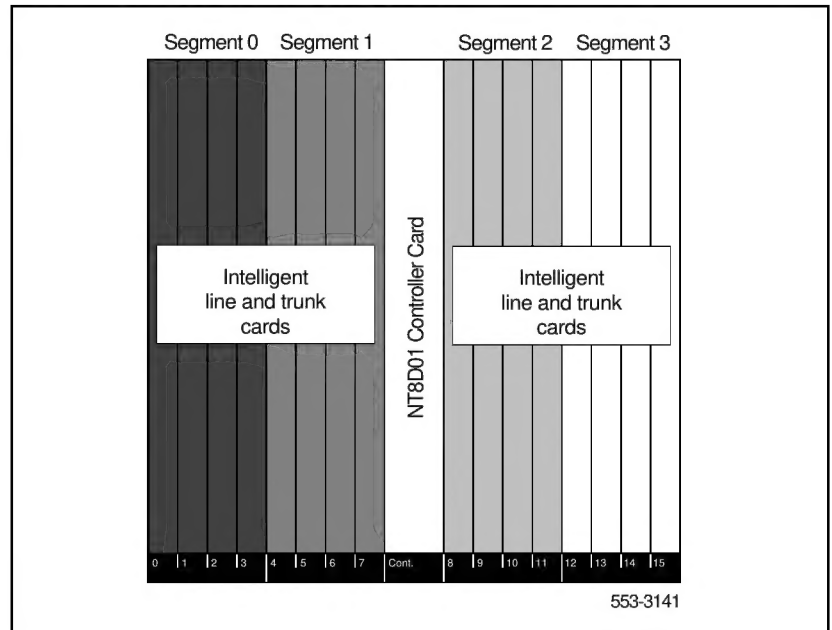
An additional switching stage is required between groups in multiple-group configurations. This switching stage, an extension of the originating and terminating network loops, is provided through the intergroup switch cards in Network Modules and the junctor board in the InterGroup Module.

Superloop network configurations

By combining four network loops, the superloop network card makes 120 timeslots available to IPE cards. Compared to regular network loops, the increased bandwidth and a larger pool of timeslots increases network traffic capacity for each 120-timeslot bundle by 25 percent (at a P0.1 grade of service).

The NT8D37 IPE Module is divided into segments numbered 0–3 of four card slots each (see [Figure 20](#)). Segment 0 consists of slots 0–3, segment 1 consists of slots 4–7, segment 2 consists of slots 8–11, and segment 3 consists of slots 12–15.

Figure 20
Superloop segments in the IPE Module



A superloop is made up of NT8D04 Superloop Network cards, NT8D01AC or NT8D01BC Controller-4 or NT8D01AD Controller-2 cards, and from one to eight IPE segments. The NT8D01BC Controller-4 replaces the NT8D01AC and NT8D01AD Controller cards for replacements and new installations.

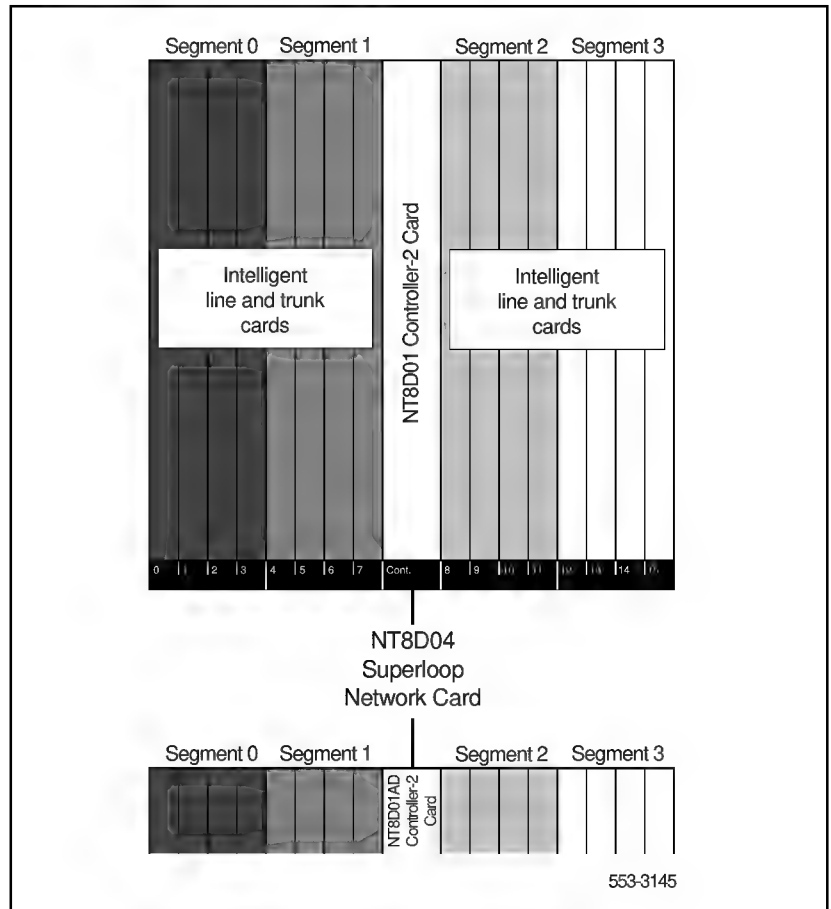
A number of superloop-to-segment configurations are possible:

- one segment per superloop requires four superloop network cards and one controller-4 card
- two segments per superloop requires two superloop network cards and one controller-2 card
- four segments per superloop requires one superloop network card and one controller-2 card
- eight segments per superloop requires one superloop network card and two controller-2 cards
- one segment per superloop/three segments per another superloop requires two superloop network cards and one controller-2 card
- two segments per superloop/six segments per another superloop requires two superloop network cards and two controller-2 cards

As an example of a superloop configuration, [Figure 21](#) shows eight segments per superloop. If a segment in this configuration is equipped with analog line cards and trunk cards, a high concentration environment of 120 timeslots to 128–512 terminal numbers (TNs) is provided. If half of the data TNs on digital line cards are enabled, this configuration provides a concentration of 120 timeslots to 768 TNs.

For a detailed description of superloop-to-segment configurations, see *Meridian 1 system engineering* (553-3001-151).

Figure 21
Eight segments per superloop



Peripheral equipment

Using pulse code modulation (PCM), peripheral equipment converts analog signals to digital signals before switching is performed by the network. This conversion method samples the amplitude of the analog signal at a rate of twice the highest signal frequency, then converts the amplitude into a series of coded pulses. For telecommunications, the PCM-sampling frequency standard is 8 kHz.

Compressing-expanding (companding) PCM is a standard technique for using 8-bit words to efficiently represent the range of voice and data signals. Two standards for companding, A-Law and μ -Law, are recognized worldwide. Meridian 1 intelligent peripheral equipment conforms to both standards; the standard required is selected through software.

Peripheral equipment is associated with network loops. Peripheral equipment (PE) cards are supported by QPC414 Network Card loops. Intelligent peripheral equipment (IPE) cards are supported by NT8D04 Superloop Network Card loops. The traffic requirements of all peripheral equipment cards provisioned on a particular network loop must match the traffic capacity of that loop.

PE cards are housed in the NT8D13 PE Module. IPE cards are housed in the NT8D37 IPE Module or the NT8D11 CE/PE Module. PE and IPE cards cannot be mixed within a module.

Intelligent peripheral equipment includes:

- controller cards that provide timing and control sequences and monitoring capabilities
- analog and digital line and trunk cards that provide interfaces to equipment outside the modules (such as telephones, data terminals, and trunks)

[Table 10](#) lists the IPE cards and the number of terminations each supports.

Table 10
Intelligent peripheral equipment

Intelligent peripheral equipment cards	Number of terminations
Controller cards:	
NT8D01 Controller Card-4	N/A
NT8D01 Controller Card-2	N/A
Line cards:	
NT1R20 OPS Analog Line Card	8
NT5K02 Analog Line Card	16
NT5K96 Analog Line Card	16
NT8D02 Digital Line Card	16 to 32
NT8D03 Analog Line Card	16
NT8D09 Analog Message Waiting Line Card	16
Note 1: Terminal number (TN) density per segment is 16 to 128 TNs, with 64 to 512 TNs per IPE Module. The maximum TN density assumes all slots are equipped with NT8D02 Digital Line Cards with 16 voice and 16 data TNs provisioned. A typical mix of line and trunk cards yields a nominal density of 64 TNs per segment, 256 TNs per IPE Module. Note 2: The NT8D03 Analog Line Card was replaced by the NT8D09 Analog Message Waiting Line Card as of January 1992.	

Table 10
Intelligent peripheral equipment

Intelligent peripheral equipment cards	Number of terminations
Trunk cards:	
NT5K07 Universal Trunk Card	8
NT5K17 Direct Dial Inward Trunk Card	8
NT5K18 Extended CO Trunk Card	8
NT5K19 E&M/2280 Hz Trunk Card	4
NT5K36 Direct Inward/Direct Outward Dial	4
NT5K70 Extended CO Trunk Card	8
NT5K71 Extended CO Trunk Card	4
NT5K72 E&M Trunk Card	4
NT5K82 Extended CO Trunk Card	8
NT5K83 E&M Trunk Card	4
NT5K84 Direct Inward Dial Trunk Card	8
NT5K90 Extended CO Trunk Card	8
NT5K93 Extended CO Trunk Card	8
NT5K99 Extended CO Trunk Card	8
NT8D14 Universal Trunk Card	8
NT8D15 E&M Trunk Card	4
NTAG03 Extended CO Trunk Card	8
NTAG04 Extended CO/Direct Inward Dial	8
NTAG36 Meridian Integrated RAN	8
NTCK16 Generic Extended Flexible CO Card	8
Note 1: Terminal number (TN) density per segment is 16 to 128 TNs, with 64 to 512 TNs per IPE Module. The maximum TN density assumes all slots are equipped with NT8D02 Digital Line Cards with 16 voice and 16 data TNs provisioned. A typical mix of line and trunk cards yields a nominal density of 64 TNs per segment, 256 TNs per IPE Module. Note 2: The NT8D03 Analog Line Card was replaced by the NT8D09 Analog Message Waiting Line Card as of January 1992.	

Table 10
Intelligent peripheral equipment

Intelligent peripheral equipment cards	Number of terminations
Special:	
NT5K20 Extended Tone Detector Card	8
NT5K48 Global Extended Tone Detector	8
NT5K92 Direct Inward Dial Tester	1
Note 1: Terminal number (TN) density per segment is 16 to 128 TNs, with 64 to 512 TNs per IPE Module. The maximum TN density assumes all slots are equipped with NT8D02 Digital Line Cards with 16 voice and 16 data TNs provisioned. A typical mix of line and trunk cards yields a nominal density of 64 TNs per segment, 256 TNs per IPE Module. Note 2: The NT8D03 Analog Line Card was replaced by the NT8D09 Analog Message Waiting Line Card as of January 1992.	

Remote peripheral equipment

In a local operating environment, peripheral equipment can be housed up to 15.2 m (50 ft) from the common equipment. Remote peripheral equipment (RPE) extends this range, allowing approximately 112.6 km (70 miles) between local and remote facilities.

This extension is achieved by converting multiplexed loop signals to a form compatible with the commonly used T-1 type digital transmission system. The cards required are housed in the NT8D47 RPE Module, refer to [Table 10](#) for a list of peripheral equipment cards that can be used at the remote site.

Any medium that conforms to the DS-1 format (1.544 Mbps) can be used to link local and remote sites, including digital microwave radio and fiber optic transmission systems.

Terminal equipment

Meridian 1 supports a wide range of telephones, including multiple-line and single-line telephones, as well as digital telephones with key and display functions and data transmission capabilities. A range of options for attendant call processing and message center applications is also available. In addition, a number of add-on devices are available to extend and enhance the features of telephones and consoles. Add-on devices include key/lamp modules, lamp field arrays, handsets, and handsfree units.

Digital telephones

Analog-to-digital conversion takes place in the digital telephone itself, rather than in the associated peripheral line card. This eliminates attenuation, distortion, and noise generated over telephone lines. Signaling and control functions are also handled digitally. Time compression multiplexing (TCM) is used to integrate the voice, data, and signaling information over a single pair of telephone wires.

For applications where data communications are required, Meridian 1 digital telephones offer an integrated data option that provides simultaneous voice and data communications over single pair wiring to a port on a digital line card.

Meridian 1 supports the following digital telephones:

- The M2006 single-line telephone has one line key and five programmable feature keys, and can connect to an optional data module.
- The M2008 standard business telephone has eight programmable line/feature keys and an optional display, and can connect to an optional data module.
- The M2016S secure telephone prevents the telephone from being used as a passive listening device in any environment in which confidential information is discussed. The M2016S has 16 programmable line/feature keys and an optional display, and can connect to an optional data module.

- The M2216 Automatic Call Distribution (ACD) telephone comes with dual headset jacks that enable high-volume call handling capability for telemarketing needs. Model 1 has two RJ-32 ports for modular electret headsets; Model 2 has one RJ-32 port for an electret supervisor headset and one PJ-327 port for a carbon agent headset. The M2216 has 16 programmable line/feature keys and a standard display, and can connect to an optional data module.
- The M2317 intelligent telephone has a built-in liquid crystal display, 11 programmable line/feature keys, and five softkeys for access to numerous features, including step-by-step prompts for optional Meridian Mail voice messaging. The M2317 can connect to an optional data module.
- The M2616 performance-plus telephone has 16 programmable keys. The M2616 can be software-assigned with handsfree communications. Optional key expansion modules can extend this telephone to provide 38 to 60 line/feature keys. The M2616 can have an optional display and can connect to an optional data module.
- The M3000 Touchphone has a touch-sensitive liquid crystal display that provides access to many features, including a customized directory of more than 250 dial-by-name entries. The M3000 can also connect to an optional data module.

Attendant consoles

Meridian 1 attendant consoles (M1250 and M2250) provide high-volume call processing. Indicators and a 4 x 40 liquid crystal display provide information required for processing calls and personalizing call answering. Loop keys and incoming call indicator (ICI) keys allow the attendant to handle calls in sequence or to prioritize answering for specific trunk groups. An optional busy lamp field provides the attendant with user status.

Meridian attendant consoles support attendant message center options. The attendant console can be connected to an IBM PC (80286, 80386, or PS2) or IBM-compatible personal computer to provide electronic directory, dial-by-name, and text messaging functions. All call processing features can be accessed using the computer keyboard.

Power equipment

Meridian 1 provides a modular power distribution architecture.

Each column includes:

- a system monitor that provides:
 - power, cooling, and general system monitoring capabilities
 - error and status reporting (except in option 21A) down to the specific column and module
- circuit breaker protection
- a cooling system with forced air impellers (except in option 21A) that automatically adjusts velocity to meet the cooling requirements of the system
- backup capabilities

Each module includes:

- an individual power supply unit with shut-off (switch or breaker) protection
- a universal quick-connect power wiring harness that distributes input voltages and monitor signals to the power supply

All options (except option 21A) are available in both AC-power and DC-power versions. The selection of an AC- or DC-powered system is determined primarily by reserve power requirements and existing power equipment at the installation site.

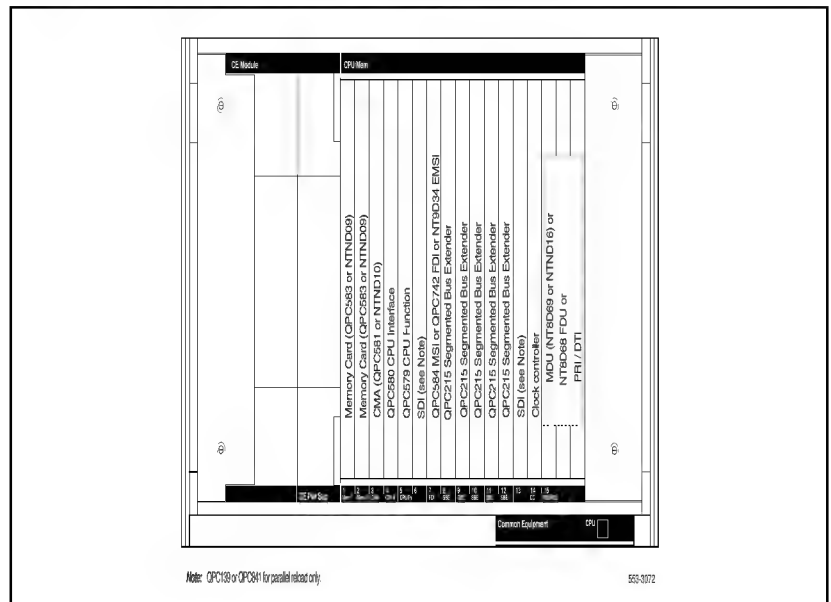
Although AC-powered and DC-powered systems have different internal power components, the internal architecture is virtually identical. AC- and DC-powered systems differ primarily in the external power components.

AC power

AC-powered systems require no external power components and can plug directly into commercial AC (utility) power. AC-powered systems are especially suitable for applications that do not require reserve power. They are also recommended for small to medium-sized systems (options 21 through 61) that require reserve power with backup times ranging from 15 minutes to 8 hours.

If reserve power is required with an AC-powered system, an uninterruptible power supply (UPS), along with its associated batteries (either internal or external to the unit), is installed in series with the AC power source (see [Figure 22](#)). AC-powered systems that do not require long-term backup can benefit from a UPS with short-term backup because the UPS typically provides power conditioning during normal operation, as well as reserve power during short outages or blowouts.

Figure 22
External AC-power architecture with reserve power

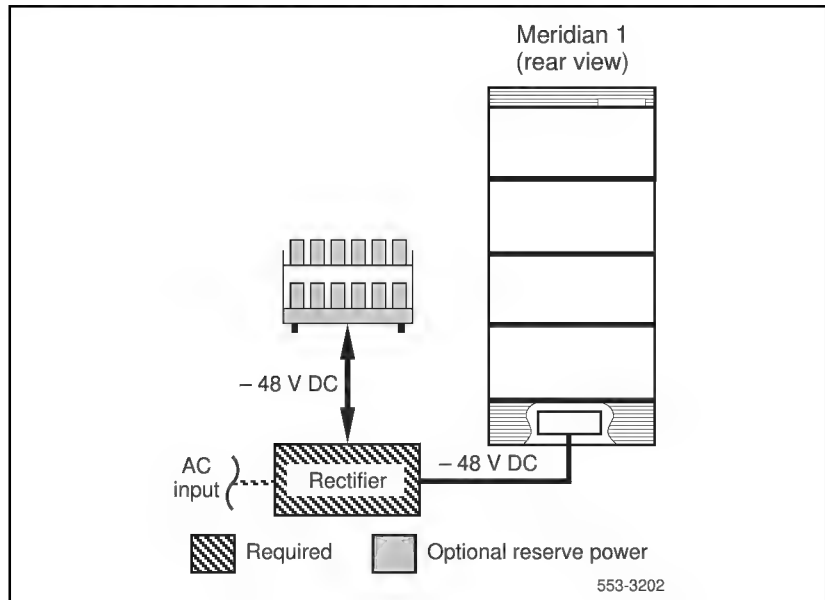


DC power

DC-powered systems are available as complete systems, with external power equipment provided by Northern Telecom; these systems can also be equipped for customer-provided external power.

DC-powered systems always require external rectifiers to convert commercial AC power into the standard -48 V dc required within the system (see [Figure 23](#)). Batteries are generally used with DC-powered systems, as the traditional telecommunications powering method is for the rectifiers to continuously charge a bank of batteries, while the system power “floats” in parallel on the battery voltage. However, batteries are only required if reserve power is needed.

Figure 23
External DC-power architecture with reserve power



Software architecture

The superloop network card and IPE cards contain microprocessors that allow you to download software changes and upgrades from the disk drive unit. These downloads can occur automatically, after a system reload, or manually, through software program commands.

Meridian 1 call processing, maintenance, and administration are controlled by software programs stored either as firmware programs, as software programs resident in system memory, or as nonresident programs on disk. The information that describes system configuration and associated peripheral equipment is called office data. This data resides in the system memory and on disk.

Firmware

Firmware provides fundamental programs consisting of hard-wired logic instructions stored in programmable read-only memory (PROM). Firmware programs manipulate data in the central processor and control input/output operations, error diagnostics, and recovery routines.

Software

Software programs consist of instruction sequences that control call processing, peripheral equipment, administration, and maintenance functions. Several generic software programs with optional feature packages are available.

Office data

Office data describes the characteristics of the system in terms of configuration and call-dependent information, such as features and services. Office data is arranged in blocks defining peripheral equipment, system configuration, and transient data.

Resident programs

Resident programs are always available in memory during system operation. Some resident programs are permanently programmed into the ROM portion of system memory. Other resident programs are automatically loaded into system memory at system power-up.

Resident programs include the:

- Error Monitor, which continuously monitors call processing
- Initialize Program, which locates faults and rebuilds data, and releases reserve memory areas
- Overlay Loader, which locates, checks, and loads programs into the overlay area
- Overload Monitor, which monitors the volume of system messages and determines where overloads occur
- Resident Trunk Diagnostic, which monitors all trunk calls
- System Loader, which loads resident programs from the disk drive unit into system memory at power-up
- Traffic Monitor, which examines the system schedule, transfers traffic data from accumulating to holding registers, and outputs reports

Note 1: In options 51C and 61C, software for Release 23 runs on either of two Call Processor (CP) cards:

- the 48 MB (minimum) NT9D19 CP Card with the NT5D61 IODU/C Card or NT5D20 IOP/CMDU Card.
- the NT5D10 CP Card with the NT5D61 IODU/C Card or NT5D20 IOP/CMDU Card.

Note 2: In options 81 and 81C, software for Release 23 runs on the 64 MB (minimum) NT9D19 CP Card or NT5D10 CP Card, and the NT5D61 IODU/C Card or NT5D20 IOP/CMDU Card.

All software programs, including the nonresident programs listed in the following section are resident in, and accessible from, the memory on the cards listed above.

Nonresident programs

Nonresident programs are stored on data disk and loaded into the overlay area of system memory to perform specific tasks. Only one program can be loaded at a time and is removed from the overlay area when no longer required.

Nonresident programs can be loaded automatically, under program control, or manually, through software commands.

Nonresident programs are manually loaded into memory through the system terminal (or maintenance telephone). Only one device can access the overlay area at any time. More than one device, however, can receive output simultaneously. A terminal can be configured as an input-only, output-only, or input and output device.

Software programs provide the system interface for maintenance, service change, and traffic measurement. Each program is independent and has its own specific set of commands and formats. These programs run concurrently with normal call processing without interfering with system traffic.

There are five main categories of nonresident programs:

- service change and print routines
- maintenance diagnostics
- traffic
- equipment data dump
- software audit

Service change and print routines

Service changes do not usually require hardware changes. Instead, the service administration programs are used to create or modify all aspects of the system from individual feature key assignments to complete system configurations. There are also programs and print routines for retrieving data from the system to check the status of office data assignments.

Maintenance diagnostics

These programs are the primary instrument for clearing system faults. Individual programs are used for automatically or manually testing the common equipment and peripheral equipment. The programs can be loaded into the overlay area at the request of maintenance personnel, or as part of a daily maintenance routine automatically initiated by the system at a specified time. In addition, background and signaling diagnostic routines can occupy the overlay area when it is not in use.

Traffic

All systems are equipped with traffic data accumulation programs. There is also a resident traffic print program that examines the schedules, transfers data from accumulating to holding registers in accordance with schedules, and prints the traffic data. In addition, there is a traffic program used to query and modify schedules, options, and thresholds.

Equipment data dump

After making service changes, the changes must be transferred to disk in order to save them. When the equipment data dump program is run, all the office data in the read/write memory is written to the system disk. The program can be run automatically during the midnight routine or on a conditional basis (for example, a data dump would only occur if a software service change has been made). It can also be run manually through the system terminal.

The data dump program is also used to install a new generic version or issue and capture protected data store information (such as speed call lists) that may be changed by a user.

Software audit

This program monitors system operation and gives an indication of the general state of the system operation. The program is concerned mainly with the system software. When a software problem is encountered, the program attempts to clear the problem automatically.

Advanced Meridian 1 system architecture

Options 51C, 61C, 81, and 81C “core” processor cards more than double the real-time call processing capacity of earlier processor cards, supports extensive networking, and provide intensive use of software features and applications, including call centers of up to 1000 agents.

The core software architecture incorporates a real-time multitasking operating system, as well as SL-1 code that delivers features and call processing. This architecture guarantees feature transparency to the user upgrading to the core CPU. The core architecture also provides significant operation, administration, and maintenance enhancements for the people who work closely with the system software and hardware.

All core overlays reside in dynamic random-access memory (DRAM) after they are loaded from the hard disk during an initial software load (software is shipped on redundant hard disks). The Resident Overlays featured in core based systems ensure subsecond speeds in accessing the overlays.

Along with software enhancements provided by X11 release 19, the capacity enhancement in the core architecture is provided by the core control complex. In the option 81 with Core Modules, the core control complex refers to the two Core Modules, Core 0 and Core 1. In the option 61C and option 81C with Core/Network Modules, the core control complex refers to the two Core/Network Modules, Core/Network 0 and Core/Network 1. In the option 51C, the core control complex refers to a Core/Network Module. The Core and Core/Network Modules are fully redundant, with Core 1 duplicating the contents of Core 0.

The backplane in the option 81 Core Modules is divided into two functional areas. The “interface” side houses a clock controller card, a three-port extender card, and up to two optional PRI/DTI cards. The “core” side provides an interprocessor bus (IPB).

The backplane in the options 51C, 61C, and 81C Core/Network Module is divided into “core” and “network” sides. The “network” side allows up to eight network cards to be installed for call processing capability.

The IPB is a very fast 32-bit address and data multiplexed multimaster bus that enables efficient communications with I/O interfaces and adjunct processors. The IPB is an asynchronous bus with speeds in the hundreds of megabits per second, resulting in a cumulative total speed many times greater than, for example, the 10-MB speed of Ethernet.

In each Core or Core/Network Module, the core side houses the following equipment:

- one Call Processor (CP) card
- one Input/Output Disk Unit with CD-ROM (IODU/C) or IOP/CMDU
- one (options 51C and 61C) or up to three (option 81C) core-to-network interface (CNI) cards
- CBT for option 81 or option 61C with NT9D11 Core/Network Module

Options 51C/61C/81/81C supports three types of CP cards:

- The NT6D66 CP card incorporates a 32-bit Motorola 68030 processor with single in-line memory modules (SIMMs) that provide a total of 24 or 48 MB of memory. Use the 48 MB version to run X11 Release 22 on option 51C or 61C.
- The NT9D19 CP card incorporates a 32-bit Motorola 68040 processor with single in-line memory modules (SIMMs) that provide a total of 48, 64, or 96 MB of memory. Use the 48 MB version to run X11 Release 22 on option 51C or 61C, and the 64 MB version to run X11 Release 22 on option 81 or 81C.
- The NT5D10 CP card incorporates a 32-bit Motorola 68060 processor with single in-line memory modules (SIMMs) that provide a total of 48, 64, 80, or 112 MB of memory. Use the 48 MB version to run X11 Release 23 on option 51C or 61C, and the 64 MB version to run X11 Release 23 on option 81 or 81C.

Cabling between the CP cards allows memory shadowing and dual-CPU operation.

The CNI card provides the interface between the IPB and the network shelf, and between the CP card and three-port extender cards in the network shelf. Each CNI card provides two ports. In a typical configuration, three CNI cards support five network groups.

Release 23 introduces the NT5D61 Input/Output Disk Unit with CD-ROM (IODU/C) for options 51C/61C/81/81C. The IODU/C replaces the IOP/CMDU card, using an industry-standard 2MB floppy drive and a CD-ROM drive (on the NT5D61AA vintage) to install system software from a CD-ROM.

The IODU/C uses a Security Device and an electronic Keycode rather than a Security Cartridge, to perform security authentication. The Keycode file contains information about which features the system provides as well as Incremental Software Management limits, which determine the various system limits, such as the number of Loops, TNs, RAN connections, etc., allowed.

The CBT card provides logical terminations to the 32-bit address/data multiplexed IPB signals across the core control section of the Core Module. For the Core/Network Module, the CBTs are replaced by hybrid bus terminators that are an integral part of the backplane of the Core/Network Module.

Core modules can diagnose faults in field-replaceable units for all core hardware, including cables. In case of a failure, a message in a natural language (such as English) appears on the system terminal and on the liquid crystal display (LCD) of the CP card. All messages can be stored in a file for future diagnostics.

[Figure 24](#) provides a block diagram of the option 61C and the option 51C core architecture. The option 51C architecture is represented by the top half of [Figure 24](#). [Figures 27](#), 26, 27, and 28 provide a block diagram of options 81 and 81C with the Core Modules and Core/Network Modules architecture.

Figure 24
Options 51C and 61C core complex

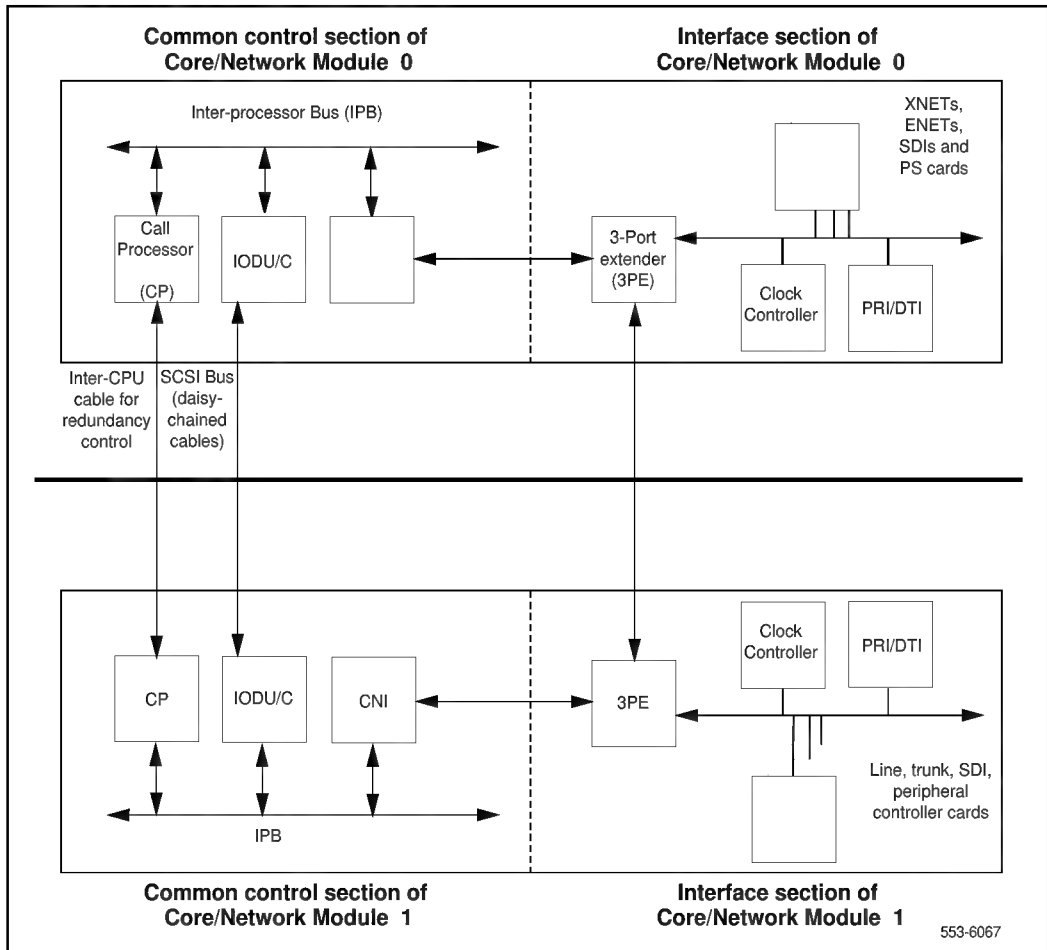


Figure 25
Option 81 core complex

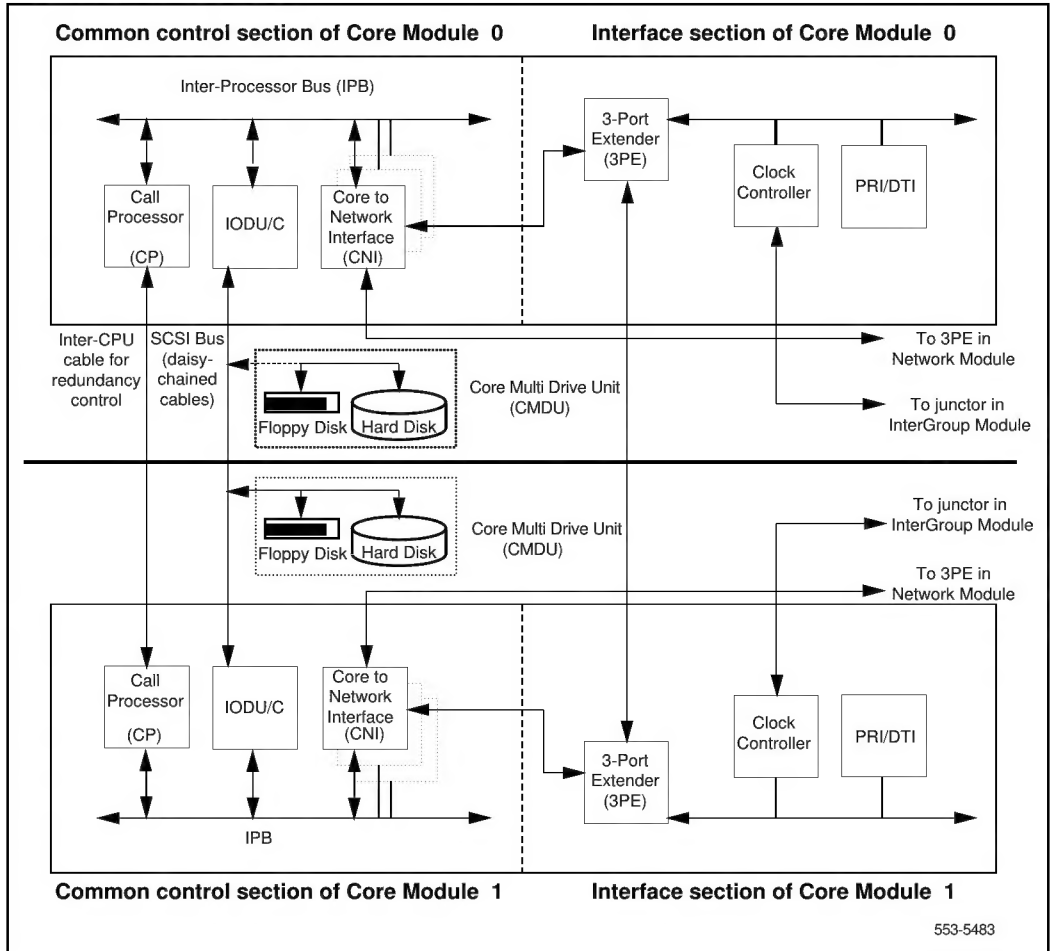


Figure 26
Option 81 network connections

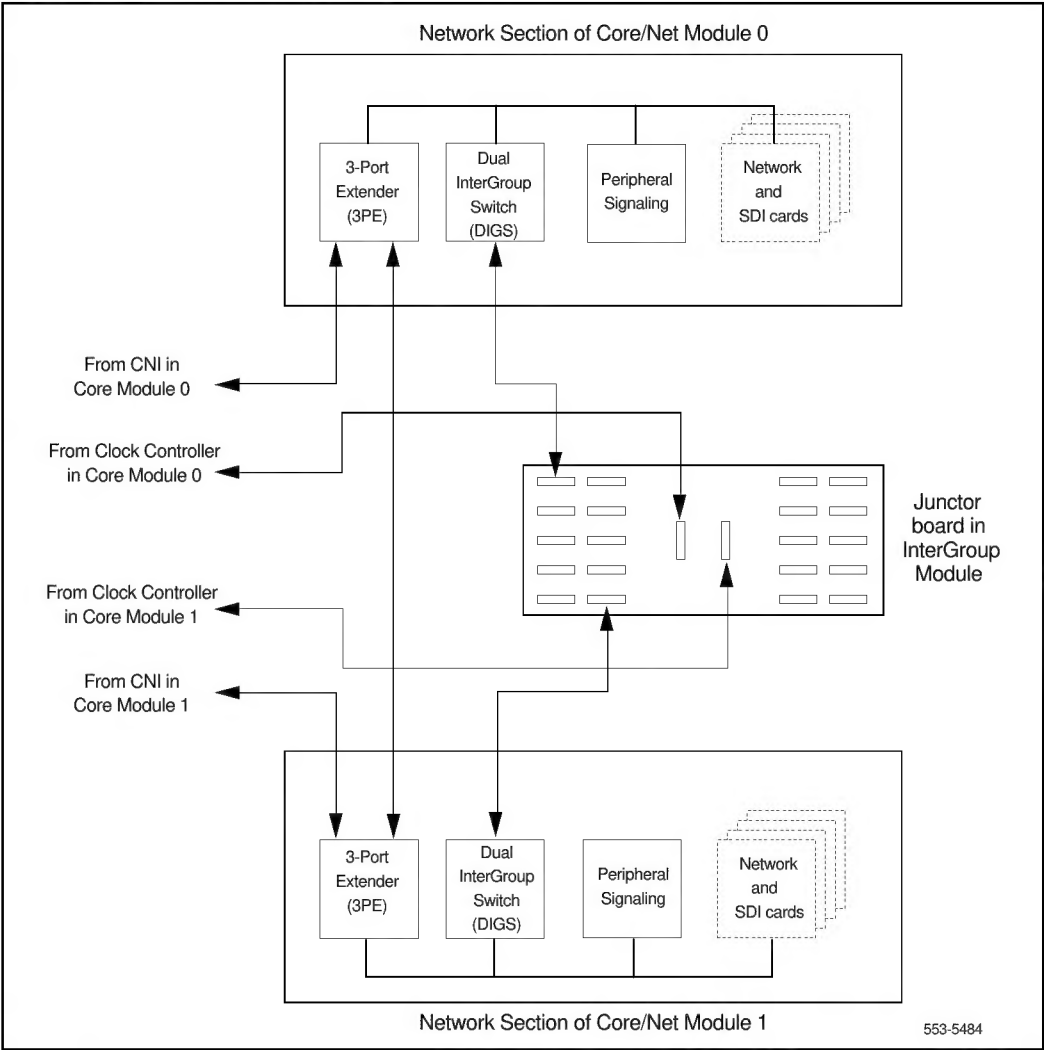


Figure 27
Option 81C core/network complex

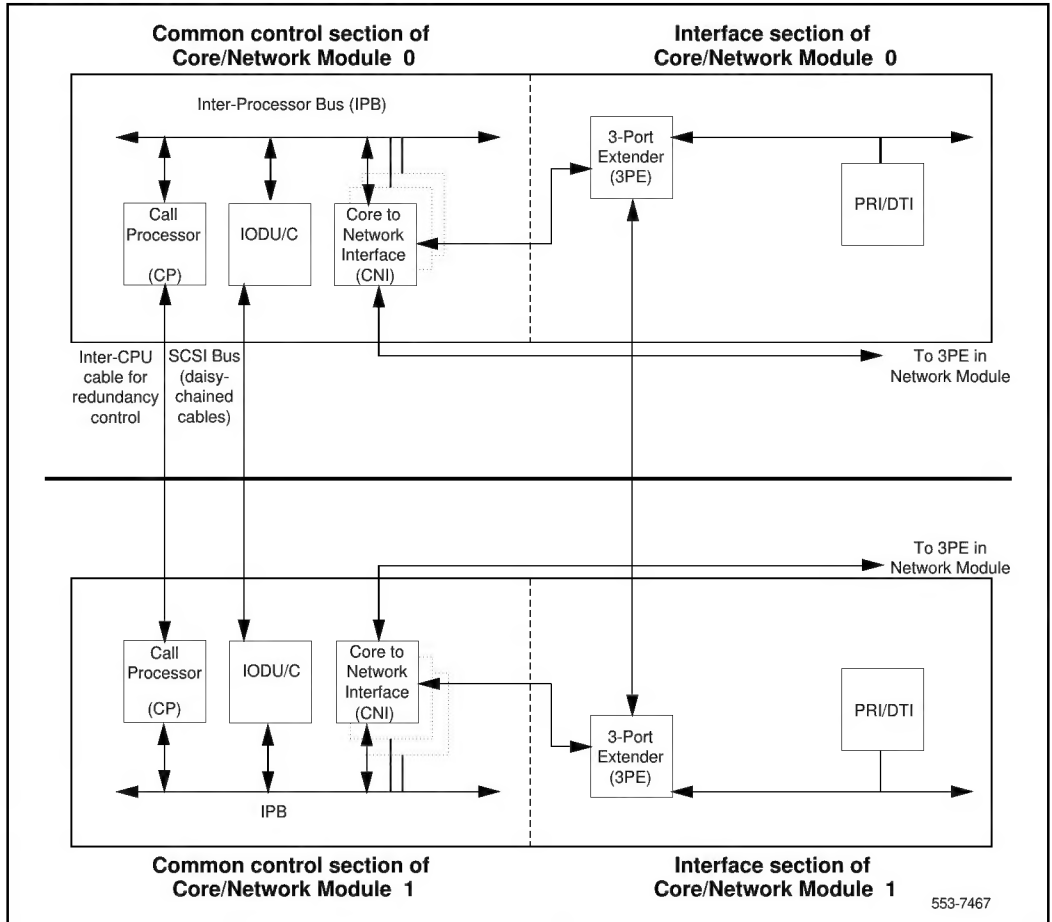


Figure 28
Option 81C network connections

